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| 09/819,760 | 03/29/2001 | Zhenguo Lu | 76855-14/PW | 2683 |

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SMART & BIGGAR/FETHERSTONHAUGH & CO.
P.O. BOX 2999, STATION D
55 METCALFE STREET
OTTAWA, ON K1P5Y6
CANADA

| EXAMINER | |
|---|---|
| PAYNE, DAVID C | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2633 | |

DATE MAILED: 08/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/819,760 | LU ET AL. | |
| | Examiner | Art Unit | |
| | David C. Payne | 2633 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *29 March 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,10-39 and 43-47* is/are rejected.

7)☒ Claim(s) *5,7-9 and 40-42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/25/2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 6, 10-39, and 43-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fishman US 6,111,679 (Fishman).

Regarding claims 1-4, 10-16, 27-30 Fishman disclosed,

A method of reducing incoherent signal power in an input optical signal containing a coherent component having a coherent signal power and a incoherent component having the incoherent signal power, the method comprising: splitting the input optical signal into M path signals each having a respective coherent path component and a respective incoherent path component and wherein M satisfies M >= 2; applying a respective phase adjustment to each of the M path signals, the phase adjustments comprising at least one fine phase adjustment applied to at least one of the M path signals, wherein the phase adjustment are applied such that at a combination point, the coherent path components are combinable constructively and each incoherent path component is substantially uncorrelated with each other incoherent path component; at the combination point, combining the M path signals to produce an output optical signal with an improved signal-to-noise ratio. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine

adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claims 19, 20-23, 31-34, 36 Fishman disclosed,

A noise reduction apparatus adapted to improve signal-to-noise ratio in an input optical signal containing a coherent component having a coherent signal power and an incoherent component having an incoherent signal power, the apparatus comprising: an input optical splitter, M optical transmission paths, and an output optical coupler, where M>=2; wherein the input optical splitter is adapted to split the input optical signal into M path signals each having a respective coherent path component and a respective incoherent path component, wherein each one of the M path signals propagates through a respective one of the M optical transmission paths resulting in a respective phase adjustment to the respective path signal; and a fine phase adjustment device in at least one of the optical transmission paths adapted to apply a fine phase adjustment to a respective one of the M path signals; wherein the phase adjustment applied by the transmission media in combination with the fine phase adjustment applied by the at least one fine phase adjustment device results in an optical path length difference, .DELTA.L.sub.o, between the two optical transmission media selected such that the incoherent path components are substantially not correlated with each other at the output optical coupler; wherein the output optical coupler couples the path signals such that substantially all of the coherent signal power is produced at a main output, while the incoherent signal power is substantially divided between the main output and one or more

subsidiary outputs. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claim 33, Fishman disclosed,

A noise reduction apparatus adapted to improve SNR in an input optical signal having a coherent component and an incoherent component, the apparatus comprising: an optical coupler, two optical transmission media, and two optical reflectors; wherein the optical coupler is adapted to split the input optical signal into two path signals each having a respective coherent path component and a respective incoherent path component, wherein each one of the two path signals propagates through a respective one of the two optical media to a respective one of the two optical reflectors where the respective path signal is reflected, and propagates back through the respective one of the two optical media to the optical coupler; and at least one fine phase adjustment device adapted to apply a respective phase adjustment to at least one of the two path signals wherein the respective phase adjustment is applied in a manner that at the optical coupler the coherent path components are coupled substantially into a single output of the coupler, and the incoherent component is coupled to multiple outputs. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claim 38, Fishman disclosed,

A method of designing a noise reduction apparatus comprising: determining a minimum allowable value of an optical path length difference, .DELTA.L.sub.o, between any two of M path signals such that incoherent path components of the any two of M path signals are substantially not correlated; determining a maximum allowable value of the optical path length difference, .DELTA.L.sub.o, between any two of M path signals to satisfy a symbol spread tolerance; selecting a phase difference between any two of M path signals in a manner that the optical path length difference, .DELTA.L.sub.o, associated with the phase difference is greater than the minimum allowable value and smaller than the maximum allowable value, and in a manner that the coherent path components of the M path signals are combined constructively at a combination point. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claim 45, Fishman disclosed,

A noise reduction apparatus for improving the signal-to-noise ratio of an optical signal, comprising: an input optical splitter adapted to split the optical signal into M path signals transmitted along respective M optical transmission paths, wherein M>=2; a phase adjustment device in at least one of the M optical transmission paths adapted to apply a phase

adjustment relative the M path signals; and an output optical coupler adapted to combine the M path signals into an output optical signal having a portion of incoherent components of each of the M path signals substantially uncorrelated and having coherent components of each M path signal constructively combined. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claim 46, Fishman disclosed,

A method of improving the signal-to-noise ratio of an optical signal comprising: splitting the optical signal into a plurality of path signals, each path signal having a coherent path component and an incoherent path component; adjusting the phase of at least one of the plurality of path signals such that, at a combination point, the coherent path components are combinable constructively and each incoherent path component is substantially uncorrelated with each other incoherent path component; and combining the path signals at said combination point. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claim 47, Fishman disclosed,

A noise reduction apparatus for an optical signal comprising: an optical splitter for splitting an input optical signal having a coherent signal component and an incoherent signal component into a plurality of path signal transmitted along a plurality of respective transmission paths; a phase adjustment device associated with at least one of the plurality of transmission paths for applying a phase difference between the plurality of path signals; and an optical coupler for combining the plurality of path signals into a main output optical signal and at least one subsidiary output optical signal, wherein the main output optical signal comprises substantially all of the coherent signal component and the subsidiary output signal comprises at least a portion of the incoherent signal component. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67). Fishman does not disclose the phase adjustment as fine adjustment. But it would have been obvious to one of ordinary skill in the art at the time of invention to since the phase delays used are fractional wavelengths, which can be understood as a fine adjustment.

Regarding claims 6, 39-44 Fishman disclosed,

A method according to claim 1 adapted for single wavelength application,

wherein the optical path length difference .DELTA.L.sub.o, between any two path signals of the M path signals results in a corresponding phase difference substantially satisfying .delta.=2p.pi., where p=.+-.1,.+-.2, . . . for a

wavelength of interest. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67).

Regarding claims 17, 18 Fishman disclosed,

A method according to claim 1 wherein the splitting, combining and phase adjustment are performed with a Mach-Zehnder/ Michelson interferometer-based structure. (see e.g., Figure 3, Figure 4, Figure 7, col./line: 1/1-15, 6/5-10, 6/60-67).

Regarding claims 24-26, 37 while Fishman does not disclose 1X2 3-db couplers or 2X2 it would have been obvious to one of ordinary skill in the art at the time of invention to use this type of coupler since it equally splits the signal power in each branch of the interferometer and is extremely well known in the art.

Regarding claim 35 Fishman disclosed,

A noise reduction apparatus according to claim 34 wherein the two reflectors are broadband fiber gratings. (see e.g., Figure 7)

***Allowable Subject Matter***

3. Claims 5, 7-9, and 40-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David C. Payne whose telephone number is (703) 306-0004. The examiner can normally be reached on M-F, 7a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (703) 305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dcp

David C. Payne
Patent Examiner
Art Unit 2633